

*March 6, 1873.*

Sir GEORGE BIDDELL AIRY, K.C.B., President, in the Chair.

In accordance with the Statutes, the names of the Candidates for election into the Society were read as follows:—

William Aitken, M.D.	Edmund James Mills, D.Sc.
Sir Alexander Armstrong, K.C.B., M.D.	Robert Stirling Newall, F.R.A.S.
Robert Stawell Ball, LL.D.	George Edward Paget, M.D., D.C.L.
Rev. Alfred Barry, D.D., D.C.L.	Francis Polkinghorne Pascoe, F.L.S.
Edward Middleton Barry, R.A.	Oliver Pemberton, M.R.C.S.
John Beddoe, B.A., M.D.	Rev. Stephen Joseph Perry.
Isaac Lowthian Bell, F.C.S.	John Arthur Phillips, F.G.S.
George Bishop, F.R.A.S.	William Overend Priestley, M.D.
Frederick Joseph Braunwell, C.E.	Charles Bland Radcliffe, M.D.
Walter Lawry Buller, Sc.D.	Alexander Rattray, M.D., R.N.
Edwin Kilwick Calver, Staff-Capt. R.N.	Edward James Reed, C.B.
Alexander Carte, M.A., M.D.	William Chandler Roberts, F.C.S.
William Chimmow, Commander R.N.	George West Royston-Pigott, M.A., M.D.
Herbert Davies, M.D.	William Westcott Rundell.
Henry Dircks.	Osbert Salvin, M.A.
Robert Lewis John Ellery, F.R.A.S.	Major-General Henry Young Dar- racott Scott, R.E., C.B.
Joseph Fayer, M.D.	John Spiller, F.C.S.
Peter Le Neve Foster, M.A.	The Hon. John William Strutt.
Thomas Minchin Goodeve, M.A.	George James Symons, F.M.S.
Lewis Dunbar Brodie Gordon, C.E.	Sir Henry Thompson, F.R.C.S.
James Augustus Grant, Lieut.-Col., C.B.	Edwin T. Truman, M.R.C.S.
John Eliot Howard.	Francis Henry Wenham, F.R.M.S.
Rev. A. Hume, LL.D.	Charles William Wilson, Capt. R.N.
Edmund C. Johnson, F.R.C.S.	Henry Woodward, F.G.S.
The Lord Lindsay, F.R.A.S.	Archibald Henry Plantagenet Stuart Wortley, Lieut.-Col.
Clements Robert Markham, C.B.	James Young, F.C.S.
William Mayes, Staff-Commander R.N.	

The following communications were read:—

- I. "On the Vapour-density of Potassium."—Preliminary Notice.  
By JAMES DEWAR and WILLIAM DITTMAR. Communicated  
by H. E. ROSCOE, F.R.S., Professor of Chemistry in Owens  
College, Manchester. Received January 27, 1873.

Since the elaborate experiments of Deville and Troost on the vapour-densities of substances at high temperatures, little has been added to chemical science in this field of research. Doubtless this is in great part owing to the difficulty of any *one* student manipulating the complex apparatus necessary for the execution of the experiments. But the operations are greatly increased in difficulty when we select bodies that are readily inflammable in air and attack with facility glass and porcelain at the high temperatures to which they are exposed. This is the reason why the molecular weights of a most important class of elementary bodies, viz. the *alkali metals* (although these are volatile at moderate temperatures), have remained to the present time undetermined. It was with the view of adding something to our knowledge in this department, that we recently undertook some experiments with potassium, the results of which we now beg leave to lay before the Society. The special difficulties we had to overcome are involved in the endeavour to answer the following questions :—

1. Is it possible to convert potassium into a gas of one atmosphere's pressure at any of the *constant* temperatures we can at present command?
2. Is it possible to generate *pure* potassium-vapour and to keep it from getting oxidized?
3. Supposing a definite volume of such vapour to have been procured, how can its *weight* be ascertained?

After a succession of failures, which we shall not detail, we at last succeeded in devising a workable process, which may be briefly described as follows :—

A cylindrical iron bottle of at least 200 cub. centims. capacity, of a thickness in the body ensuring sufficient rigidity at even a bright red heat, and provided with a well-ground inlet neck, pierced with a canal of about 2 millims. in diameter, is employed as a generator and receptacle of the vapour.

A mass of about 20 kilogrs. of zinc contained in a plumbago crucible, which being placed in a forge-fire can be readily heated up to the boiling-point, serves as a bath.

The experiment begins by first deoxidizing the inside of the receptacle at a red heat by means of a current of dry hydrogen, which is continuously maintained until the bottle has cooled down below redness. At this stage about 200 grms. of pure mercury are introduced into the bottle, which is then inserted into the red-hot zinc, without, however, covering the upper extremity of the bottle. After  $\frac{3}{4}$  of the mercury is distilled off (which is accomplished in a very short time), the neck is withdrawn,

and while the mercury-vapours are still streaming out, an iron test-tube, previously prepared with great care and charged with 4-5 grms. of potassium, is dropped into the bottle, the neck reinserted, and after the *whole* of the bottle has been immersed into the zinc, the blast of the forge is forcibly increased so as, in the shortest possible time, to bring the zinc into the state of boiling, proper arrangements being made for keeping the neck of the bottle red-hot. The potassium in a short time begins to volatilize, issuing in jets into the air and depositing caustic potash at the nozzle, which must be kept clear by means of an iron wire. As soon as the distillation of the potassium ceases, the nozzle is closed by means of a ground-in wire plug, at once immersed into a mass of mercury contained in a test-tube, and the bottle withdrawn to a proper support, on which it is allowed to cool.

After it has reached a manageable temperature, the bottle is inserted into a mass of recently boiled water, the wire plug withdrawn, and the hydrogen formed by the action of the water on the potassium pumped out, by means of a "Sprengel," into a eudiometer, to be measured.

In the experiments we have hitherto carried out, we have satisfied ourselves that the amount of mercury-vapour *not* swept out by the potassium is quite inappreciable; and as our object has been in the mean time to merely arrive at approximate results and to perfect our methods of manipulation, we have neglected the minute correction, which, on account of that small remnant of mercury, ought, strictly speaking, to have been applied to the volume of the vapour as calculated from the capacity of the bottle in the cold, the coefficient of expansion of iron, and the temperature ( $1040^{\circ}$  Deville) at which the vapour was measured.

The results of our observations conclusively show that the density of potassium-vapour, as produced in the process described, cannot exceed 45 times that of hydrogen, and that therefore the molecule of potassium consists of *two atoms* ( $K_2$ ).

We intend to prosecute our research in other directions, proposing to ascertain, if possible, the densities of the *iodides* of cesium, rubidium, and potassium, these being, according to Bunsen's experiments, the most volatile of the haloids of the alkali metals.

II. "On New Sources of Ethyl- and Methyl-Aniline." By JOHN SPILLER, F.C.S. Communicated by Dr. DEBUS, F.R.S. Received December 10, 1872.

In the process of manufacturing the Hofmann violet by the action of ethylic or methylic iodide upon rosaniline or one of its salts, there is always produced a considerable quantity of a dark-coloured resinous or pitch-like substance, which has received the name of "Hofmann gum." This by-product varies in amount and consistence according to the shade of violet simultaneously produced being much more abundant when the